

WHAT IS CLAIMED IS:

Sub A1  
5 1. A bipolar transistor comprising an emitter layer containing an impurity of a first conductivity type, a base layer containing an impurity of a second conductivity type, and a collector layer containing the impurity of the first conductivity type, said bipolar transistor having:

a high-concentration doped layer being provided in said emitter layer and doped with the impurity of the first conductivity type at a higher concentration than in said emitter layer.

sub C1 10 2. The bipolar transistor according to claim 1, wherein said high-concentration doped layer is a  $\delta$ -doped layer having a thickness of 10 nm or less.

3. The bipolar transistor according to claim 1, wherein the concentration of carriers of the first conductivity type in said high-concentration doped layer is  $1 \times 10^{19} \text{ cm}^{-3}$  or more.

15 4. The bipolar transistor according to claim 1, wherein the concentration of carriers of the first conductivity type in said high-concentration doped layer is more than ten times higher than the concentration of the carriers of the first conductivity type in said emitter layer.

20 5. The bipolar transistor according to claim 1, wherein said high-concentration doped layer is adjacent to a depletion region formed at an emitter/base junction portion.

6. The bipolar transistor according to claim 1, wherein the concentration of carriers of the second conductivity type in said base layer is higher than the concentration of carriers of the first conductivity type in said emitter layer.

7. The bipolar transistor according to claim 1, wherein said emitter layer and said base layer are composed of two types of semiconductor materials having different band gaps and the semiconductor material composing the emitter layer has the wider band gap,

5 said bipolar transistor having a heterojunction portion between said emitter layer and said base layer.

8. The bipolar transistor according to claim 7, wherein said base layer is strained.

9. The bipolar transistor according to claim 7, wherein said base layer  
10 has a portion with the band gap gradually decreasing from a region of said base layer in contact with the emitter layer toward a region of said base layer in contact with the collector layer.

10. The bipolar transistor according to claim 7, wherein said base layer is composed of a semiconductor containing at least silicon and germanium.